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DIVISION 14 - CONVEYING SYSTEMS

SECTION 14210

ELECTRIC TRACTION ELEVATORS

12/03

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NASA-14210 (December 2003)  
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SECTION 14210

ELECTRIC TRACTION ELEVATORS  
12/03

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NOTE: Delete, revise, or add to the text in this section to cover project requirements. Notes are for designer information and will not appear in the final project specification.

This section covers electric passenger and freight elevator design and installation, where equipment, material, construction, and installation is provided by the elevator manufacturer.

Appropriate drawings and specifications must be included to cover the work outlined below in a manner consistent with the requirements of ASME A17.1 and ASME A17.2.

Hoistway construction concerned with structure and enclosure, must be detailed. This Includes:

- a. Degree of fire resistance,
- b. Structural system for drive machines,
- c. Secure installation of guide rails,
- d. Roughing-in for hoistway entrances,
- e. Structural steel at landing edges,
- f. Protective steel at landing loading edges,
- g. Necessary venting of hoistway,
- h. Elevator pit,
- i. Access doors to hoistway,
- j. Concrete pit,
- k. Waterproofing,
- l. Necessary access ladders,
- m. Drains,
- n. Screens,
- o. Lighting of all areas,
- p. Locations, recesses for hall indicators,
- q. Buttons, lanterns, switches,
- r. Complete electric service,
- s. Include power panel in elevator machine room,
- t. Configuration of entrance jambs,
- u. Structural supports for elevator doors.

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## PART 1 GENERAL

### 1.1 REFERENCES

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NOTE: The following references should not be  
manually edited except to add new references.  
References not used in the text will automatically  
be deleted from this section of the project  
specification.  
\*\*\*\*\*

The publications listed below form a part of this section to the extent  
referenced:

#### AMERICAN WELDING SOCIETY (AWS)

AWS D1.1/D1.1M (2002) Structural Welding Code - Steel

#### ASM INTERNATIONAL (ASM)

ASM 06542G (1985) Metals Handbook

#### ASME INTERNATIONAL (ASME)

ASME A17.1 (2001) Safety Code for Elevators and  
Escalators; (Includes Interpretations)

ASME A17.2 (1988; A17.2.3a 2000) Inspector's Manual  
for Elevators and Escalators

ASME B17.1 (1967; R 1998) Keys and Keyseats

#### ASTM INTERNATIONAL (ASTM)

ASTM A 325 (2000) Standard Specification for  
Structural Bolts, Steel, Heat Treated,  
120/105 ksi Minimum Tensile Strength

ASTM A 325M (2000) Standard Specification for High  
Strength Bolts for Structural Steel Joints  
(Metric)

#### ILLUMINATING ENGINEERING SOCIETY OF NORTH AMERICA (IESNA)

IES RP-1 (1993) Office Lighting

#### INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1 (1998) American National Standards for  
Accessible and Usable Buildings and  
Facilities

NATIONAL ELECTRICAL MANUFACTURER'S ASSOCIATION (NEMA)

NEMA MG 1 (1998) Motors and Generators

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

NFPA 70 (2002) National Electrical Code

THE SOCIETY FOR PROTECTIVE COATINGS (SSPC)

SSPC Paint 102 (1991) Black Alkyd Paint

## 1.2 SYSTEM DESCRIPTION

### 1.2.1 General Requirements

\*\*\*\*\*

**NOTE: If Section 16003 GENERAL ELECTRICAL PROVISIONS is not included in the project specifications, applicable requirements therefrom should be inserted and the first paragraph deleted. If Section 16225 MOTORS is not included in the project specification, applicable requirements therefrom should be inserted and the second paragraph deleted.**

\*\*\*\*\*

Section 16003 GENERAL ELECTRICAL PROVISIONS applies to work specified in this section.

Section 16225 MOTORS applies to work to this section.

Connection Diagrams shall be submitted for electric passenger and freight elevator systems indicating the relations and connections of devices and apparatus by showing the general physical layout of all controls, the interconnection of one system (or portion of system) with another, and internal tubing, wiring, and other devices.

Schematics shall be submitted for elevator systems including annotated ladder logic diagrams for [programmable] [pre-programmed] logic controllers.

Fabrication Drawings shall be submitted for electric passenger and freight elevator systems consisting of fabrication and assembly details to be performed in the factory.

Notice to the Contracting Officer shall be given at least [14] [\_\_\_\_\_] calendar days prior to date proposed for conducting each training course.

### 1.2.2 Design Requirements

Provide [passenger] [freight] elevators, accessory equipment, and installation that meets or exceeds requirements of ASME A17.1.

Manufacturer's Standard Color Charts shall be submitted for elevator

systems showing the manufacturer's recommended color and finish selections.  
Sample alarm covers shall also be submitted for approval.

#### 1.2.2.1 Passenger Elevator

Rated Load [\_\_\_\_\_] pounds (lb)  
Speed [\_\_\_\_\_] feet per minute (fpm)  
[Travel [approximately] [\_\_\_\_\_] feet (ft), [\_\_\_\_\_] inches (in)]  
[Travel [\_\_\_\_\_] floor to [\_\_\_\_\_] floor]  
Platform Size [\_\_\_\_\_] ft [\_\_\_\_\_] in wide  
by [\_\_\_\_\_] ft [\_\_\_\_\_] in deep  
Clear Car Inside [\_\_\_\_\_] ft [\_\_\_\_\_] in wide  
by [\_\_\_\_\_] ft [\_\_\_\_\_] in deep  
Landings [\_\_\_\_\_] [as indicated]  
Hoistway & Car Door Type: [center opening-horizontal sliding]  
[single speed horizontal sliding]  
[two-speed horizontal sliding].

Rated Load [\_\_\_\_\_] kilogram  
Speed [\_\_\_\_\_] meter per second  
[Travel [approximately] [\_\_\_\_\_] meter]  
[Travel [\_\_\_\_\_] floor to [\_\_\_\_\_] floor]  
Platform Size [\_\_\_\_\_] millimeter wide  
by [\_\_\_\_\_] millimeter deep  
Clear Car Inside [\_\_\_\_\_] millimeter wide  
by [\_\_\_\_\_] millimeter deep  
Landings [\_\_\_\_\_] [as indicated]  
Hoistway & Car Door Type: [center opening-horizontal sliding]  
[single speed horizontal sliding]  
[two-speed horizontal sliding].

#### 1.2.2.2 Freight Elevator

Rated Load [\_\_\_\_\_] pounds (lb)  
Loading: ASME A17.1 Class [A] [B] [C1] [C2] [C3],  
based on [\_\_\_\_\_] pounds per square foot (psf)  
Speed [\_\_\_\_\_] feet per minute (fpm)  
[Travel [approximately] [\_\_\_\_\_] feet (ft), [\_\_\_\_\_] inches (in)]  
[Travel [\_\_\_\_\_] floor to [\_\_\_\_\_] floor]  
Platform Size [\_\_\_\_\_] ft [\_\_\_\_\_] in wide  
by [\_\_\_\_\_] ft [\_\_\_\_\_] in deep  
Clear Car Inside [\_\_\_\_\_] ft [\_\_\_\_\_] in wide  
by [\_\_\_\_\_] ft [\_\_\_\_\_] in deep  
Landings [\_\_\_\_\_] [as indicated]

Hoistway Door Type: [Vertical] [Horizontal], [bi-parting] [lift]  
Size: [\_\_\_\_\_] ft [\_\_\_\_\_] in wide  
[\_\_\_\_\_] ft [\_\_\_\_\_] in high  
Car Gate Type: [Balanced counterweighted,] [Vertical sliding]  
[\_\_\_\_\_]

Rated Load [\_\_\_\_\_] kilogram  
Loading: ASME A17.1 Class [A] [B] [C1] [C2] [C3],  
based on [\_\_\_\_\_] kilogram per square meter

Speed [\_\_\_\_\_] meter per second  
 [Travel [approximately] [\_\_\_\_\_] millimeter]  
 [Travel [\_\_\_\_\_] floor to [\_\_\_\_\_] floor]  
 Platform Size [\_\_\_\_\_] millimeter wide  
 by [\_\_\_\_\_] millimeter deep  
 Clear Car Inside [\_\_\_\_\_] millimeter wide  
 by [\_\_\_\_\_] millimeter deep  
 Landings [\_\_\_\_\_] [as indicated]

Hoistway Door Type: [Vertical] [Horizontal], [bi-parting] [lift]  
 Size: [\_\_\_\_\_] millimeter wide  
 [\_\_\_\_\_] millimeter high  
 Car Gate Type: [Balanced counterweighted,] [Vertical sliding]  
 [\_\_\_\_\_]

### 1.2.3 Performance Requirements

Hoist motor shall provide continuous service of not less than [140] [\_\_\_\_\_] floor stops per hour, and with this service motor windings shall not exceed [50] [\_\_\_\_\_] degrees C ambient temperature rise. Speed regulation, when the car is carrying its rated load, shall not exceed plus or minus 5 percent of the average round trip speed. [Acceleration under full load, up and down, shall be not less than [5] [1.52] [\_\_\_\_\_] fps meter per second or greater than [6] [1.83] [\_\_\_\_\_] fps, meter per second, measured from start of car motion to time of attaining [80] [\_\_\_\_\_] percent of full rated speed.] [Acceleration control shall be adjustable.]

### 1.2.4 Operational Requirements

#### 1.2.4.1 Hoistway and Car Door - Passenger Elevator

Doors shall operate smoothly in both directions and shall be cushioned to stop at full-open and full-closed positions. Doors shall open and close [with average speed of [2-1/2] [0.76] [\_\_\_\_\_] fps meter per second] [within maximum time of [4] [\_\_\_\_\_] seconds] or as required by ICC A117.1.

Door operations shall be integrated with car-leveling system to prevent elevator movement before doors close.

Doors shall operate in following manner:

- a. Hoistway door closure shall lead car-door closure; car-door opening shall lead hoistway-door opening.
- b. Opening of car door shall begin when car is [in last foot of travel before stopping] [\_\_\_\_\_] hoistway door opening shall [not begin until car is stopped] [\_\_\_\_\_] .
- c. Upon initial opening, doors remain open for a predetermined interval, adjustable from 0 to [8] [\_\_\_\_\_] seconds.
- d. DOOR OPEN buttons shall open doors unless elevator is in motion. DOOR CLOSE button is supplementary to automatic closure of doors when a call button is pressed.



- e. Pressing DOOR OPEN button shall temporarily open doors unless car is moving. Pressing DOOR CLOSE button shall close doors, subject to door-edge controls specified.
- f. Door closing shall reverse when using DOOR OPEN button or car doorinfra-red light curtain sensors are interrupted.
- g. Upon initial interruption of photoelectric light [curtain], door reclosing time shall become shorter at a predetermined interval, adjustable from 0 to [4] [\_\_\_\_\_] seconds.
- h. Should either light [curtain] be interrupted while doors are closing, doors shall return to open position, reclosing again after a predetermined interval.
- i. When doors are unable to close within an interval of 0 to [30] [\_\_\_\_\_] seconds, the [photoelectric unit and door safety edge][light curtain] devices shall be made inoperative and a loud buzzer shall be activated while doors close at reduced speed.

#### 1.2.4.2 Hoistway and Car Gate - Freight Elevator

Operators shall move car gates at a minimum speed of [1] [0.30][\_\_\_\_\_] foot meter per second in a sequenced operation.

Equip doors for manual operation from within car when power fails. Mechanical interlock shall prevent doors from opening except when elevator is at landing. Electrical controls shall prevent car movement unless gate is closed. Equip gates with safety devices which reopen gates when obstructions are encountered.

Integrate door operation with car-leveling system preventing car movement prior to door closure. Prevent doors from opening prior to elevator stop.

#### 1.2.4.3 Operation and Control System - Passenger Elevator

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**NOTE: Inherent advantages occur with "selective collective automatic operation" systems as defined by ASME A17.1. Only these are specified.**

**Choose paragraphs from the following to specify Single Car or Multiple Car Operation.**

\*\*\*\*\*

Design system for automatic flush leveling of car at each stop.

Single Car Operation: Operation system shall be "selective collective automatic operation" as defined by ASME A17.1. [Car shall return to first-floor landing after calls are satisfied, remaining there with doors open until a call is registered.] Key-activated maintenance switch shall deactivate call buttons and permit car operation by car station buttons.

Multiple Car Operation: Operation system shall be "selective collective automatic operation." Provide these additional features with key-operated selector switch:

- a. When no calls are registered, cars shall be stationed at first floor. One car shall be fully lighted, other cars shall maintain [25] [\_\_\_\_\_] percent of normal illumination. Cars with reduced illumination shall display illuminated sign, OTHER CAR PLEASE. When fully lighted car leaves first floor, illumination of second, or next, car shall normalize and sign shall extinguish.
- b. When car is at first floor while another car is answering calls, standing car shall respond to calls for up travel, registered on floors below an active elevator traveling up; car shall respond to calls for down travel registered on floors above an active elevator traveling down.
- c. First car returning to home floor shall remain there. Car shall then respond when up calls are registered on floors below an active car traveling up, or down calls from floors above an active car traveling down.
- d. When, with one car standing at first landing, another car arrives at first-floor with calls answered, the last car to arrive becomes reserve car [with dimmed illumination and OTHER CAR PLEASE sign].
- e. Provide key-activated switches to place any car in single car operation, or to remove any car from service while others remain in multiple car operation.

#### 1.2.4.4 Operation and Control Systems - Freight Elevator

Design system for automatic flush leveling of car at each stop.

Provide "single automatic operation" systems defined by ASME A17.1. Key-activated maintenance switch shall deactivate call buttons and permit car operation by car station buttons.

When car is not in use, depression of call buttons at any landing shall operate doors and dispatch car. When car arrives at landing, car gates and hoistway doors shall open. Car shall remain at landing until a button in car or at another landing is pressed.

Pressing CLOSE DOOR button shall close doors.

Pressing call button at landing where car is stationed with doors closed shall open doors.

Pressing call buttons at other landings while car door is closed shall dispatch car.

When call is made at another landing while car doors are open, alarm shall sound to warn user.

When DOOR OPEN button in car is not pressed within [30] [\_\_\_\_\_] seconds, doors shall close and car shall proceed to landing from which call originated.

When DOOR OPEN button is pressed within [30] [\_\_\_\_\_] seconds after warning sounds, provide an interval of [60] [\_\_\_\_\_] seconds before next warning.

When DOOR OPEN button is not used within [30] [\_\_\_\_\_] seconds, doors shall close and elevator shall proceed unless door is obstructed.

Pressing landing DOOR CLOSE button when car is free to respond shall close doors and dispatch elevator to satisfy call.

After car is underway in response to car panel commands, no landing calls shall be answered until car calls have been completed. Car calls shall have precedence over landing calls.

### 1.3 SUBMITTALS

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**NOTE: Review submittal description (SD) definitions in Section 01330 SUBMITTAL PROCEDURES and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control. Include a columnar list of appropriate products and tests beneath each submittal description.**

\*\*\*\*\*

The following shall be submitted in accordance with Section 01330 SUBMITTAL PROCEDURES in sufficient detail to show full compliance with the specification:

#### SD-01 Preconstruction Submittals

Notice to the Contracting Officer shall be submitted in accordance with paragraph entitled, "General Requirements," of this section.

#### SD-02 Shop Drawings

The following shall be submitted for electric passenger and freight elevator systems in accordance with paragraph entitled, "General Requirements," of this section.

Connection Diagrams  
Schematics  
Fabrication Drawings

Installation Drawings shall be submitted for electric passenger and freight elevator systems accordance with the paragraph entitled, "Installation," of this section.

#### SD-03 Product Data

Equipment and performance data shall be submitted for the following items consisting of load ratings, design speeds, car and platform dimensions, and opening and closing speeds.

Manufacturer's catalog data shall be submitted for the following items also:

- Car Frame and Platform
- Driving Machine
- Motor-Generator Set
- Hoistway and Car Doors
- Hoistway Entrances and Car Gates
- Operation and Control Systems
- Operating System
- Emergency Operation and Signaling
- Operating Devices
- Telephone
- Guiderails
- Terminal Stopping Devices
- Safeties
- Electrical Protective Devices
- Electrical Equipment

Manufacturer's catalog data shall be submitted for the following items as well:

- Paint Materials
- Entrances
- Entrance Frames
- Counterweights
- Hoisting Ropes
- Emergency Exit
- Entrance Sill

#### SD-04 Samples

Manufacturer's Standard Color Charts shall be submitted for elevator systems in accordance with paragraph entitled, "Design Requirements," of this section.

#### SD-06 Test Reports

Test reports on the following tests shall be submitted for elevator systems in accordance with ASME A17.1.

- Continuous-Operations Test
- Temperature Rise Test
- Acceptance Inspection

#### SD-07 Certificates

Certificates shall be submitted in accordance with paragraph

entitled, "Certifications," of this section.

#### SD-10 Operation and Maintenance Data

Operation and Maintenance Manuals shall be submitted in accordance with paragraph entitled, "Operation and Maintenance," of this section.

### 1.4 QUALIFICATIONS

#### 1.4.1 Independent Testing Laboratory

Contractor shall employ an independent testing laboratory to conduct tests specified.

#### 1.4.2 Certifications

Contractor shall certify that each product used complies with ASME B17.1, Rule 1101, and been tested to those requirements by independent laboratories within a two year period.

Certificates shall be submitted certifying that each product used complies with ASME A17.1, Rule 1101, and has been tested to those requirements by an independent testing laboratory within a two year period.

### 1.5 QUALIFICATIONS FOR WELDING WORK

\*\*\*\*\*  
**NOTE: If Section 05095 WELDING STEEL CONSTRUCTION**  
**is not included in the project specification,**  
**applicable requirements therefrom should be inserted**  
**and the following paragraph deleted.**  
\*\*\*\*\*

[Section 05095 WELDING STEEL CONSTRUCTION applies to work specified in this section.]

## PART 2 PRODUCTS

### 2.1 CAR FRAME AND PLATFORM (PASSENGER ELEVATORS)

#### 2.1.1 Passenger Elevator Platform

Platform floor shall be [steel] [or a] [marine plywood] [\_\_\_\_\_] floor over a [steel] [\_\_\_\_\_] base.

[Provide [steel] [\_\_\_\_\_] platforms with sound isolation.] [Wood platforms shall be fastened to frames, [metal] fire protection shall be provided on underside of platform stringers.]

Car flooring shall be covered with [tile] [\_\_\_\_\_] [in colors as selected]. Attachment method shall be as recommended by manufacturer [except emulsion adhesives are not acceptable.]

## 2.1.2 Passenger Elevator Cars

### 2.1.2.1 Car Body

Finish for [corrosion-resistant steel] [\_\_\_\_\_] shall be [ASM 06542G No. 6] [\_\_\_\_\_].

Sides and rear of car shall be constructed of [plastic-laminate-surfaced wood core utilizing exterior grade plywood] [\_\_\_\_\_]. Facing shall be [fiber-reinforced phenol-formaldehyde] [\_\_\_\_\_] base with [wood-grained] [color and pattern as selected].

Provide front and sides of car with fire retardant of [26] [0.55][\_\_\_\_\_] gage millimeter [steel] [\_\_\_\_\_] sheathing.

Base of car shall be [6] [150] [\_\_\_\_\_] inch millimeterhigh, [14] [1.9] [\_\_\_\_\_] gage millimeter[corrosion-resistant steel] [\_\_\_\_\_].

Provide vents to exhaust ventilation system air.

Provide side exit panels [where required] [as indicated].

Front return panel and entrance columns shall be constructed of [corrosion-resistant steel] [\_\_\_\_\_] with [ASM 06542G No. 6] [\_\_\_\_\_] finish.

Provide illuminating position indicator panels [above door] [\_\_\_\_\_].

### 2.1.2.2 Handrails

Handrails shall be continuous around sides and back. [Provide emergency exit door handrails that swing with door.] Rails shall be [corrosion-resistant steel] [\_\_\_\_\_] and attached to car body with [corrosion-resistant steel] [\_\_\_\_\_] brackets.

### 2.1.2.3 Ceiling System

Canopy shall be [steel] [\_\_\_\_\_] , and capable of supporting work crews standing on it.

Directly below the ceiling, a subceiling shall be mounted forming a plenum to distribute ventilating system air and support lighting equipment. [A decorative ceiling shall be installed below subceiling.] Entire ceiling system shall conform to car contour.

### 2.1.2.4 Ventilating System

Provide a forced air ventilating system incorporating a [three] [\_\_\_\_\_] -speed squirrel cage blower delivering [100] [47.2] [\_\_\_\_\_] cfm liter per second per person of rated car capacity. Blower shall be sized to deliver the air required at a fan speed of [1600] [\_\_\_\_\_] rpm. Design mounting to minimize noise and prevent vibration. Motor shall meet requirements of Section 16225 MOTORS and be UL listed.

#### 2.1.2.5 Car Lighting and Emergency Signal System

Car lighting shall provide well-diffused illumination meeting requirements of ASME A17.1 and IES RP-1.

In addition to requirements of ASME A17.1, emergency lighting power system shall consist of power packs [on top of elevator] [\_\_\_\_\_] and lighting fixtures inside elevator car.

Power pack shall be [sealed gel cell type] [\_\_\_\_\_] , with solid state controls and regulating charger connected to normal power supply. Power pack shall provide [one] [\_\_\_\_\_] hour emergency bell operation and [four] [\_\_\_\_\_] hours of continuous illumination.

Unit shall contain the following:

- a. [Alarm bell] [\_\_\_\_\_] connected to elevator alarm and alarm button.
- b. Light fixture with on-off switch and protective wire guard.
- c. Testing circuit, pilot light, and low wattage indicator.

#### 2.2 CAR FRAME AND PLATFORM (FREIGHT ELEVATORS)

##### 2.2.1 Freight Elevator Platform

Platform shall be provided with flooring of [raised pattern steel floor plate] [steel, overlaid with tongue-and-groove] [hardwood] [\_\_\_\_\_] planking.

##### 2.2.2 Freight Elevator Car

Car shall be enclosed on sides not used for entrances, with [sheet steel] [\_\_\_\_\_] extending from the platform to [top of car] [a height of [\_\_\_\_\_] feet millimeter]. Remainder of sides and top shall be covered with [[10] [\_\_\_\_\_] gage, [1] inch [3.5] [\_\_\_\_\_] millimeter, [25] [\_\_\_\_\_] millimeter diamond wire mesh] [or] [perforated [16] [1.6] [\_\_\_\_\_] gage millimeter steel] [or] [\_\_\_\_\_] secured for heavy service. Top shall support work crews standing on it without damage to canopy.

Provide bumpers, consisting of [two 6 by 2 inch 150 by 50 millimeter oak planks mounted on the rear and sides of the car with edges beveled back from entrance] [\_\_\_\_\_] .

Provide recessed [incandescent] [fluorescent] lamps and fixtures. Fixture shall consist of [metal] [\_\_\_\_\_] frame, [baked enamel] [\_\_\_\_\_] finished reflector with enclosed sides and top, mounting [directly on outlet box] [\_\_\_\_\_] . [Incandescent fixtures shall be fitted with twin lamp porcelain sockets and heavy-duty [lamp guard] [\_\_\_\_\_] over each light.] [Fluorescent fixtures shall be [dual] [\_\_\_\_\_] lamp, quick starting, with energy efficient ballasts. Safety clamps shall be provided for fluorescent tubes.] Light level shall meet or exceed requirements of ASME A17.1 and IES RP-1.

## 2.3 DRIVING MACHINE

### 2.3.1 General Machine Requirements

Elevator-driving machine shall be worm-gear, traction type. Gear housing, brake support, and motor support shall be [single cast] [or] [components shall be mounted on bedplate]. [Design and construction of equipment and parts subject to wear shall be completely interchangeable.]

Mount rotating machinery to isolate machine noise from building. Isolation system design shall prevent failure of any component from interfering with elevator operations.

Provide gasketed handhole in bottom half of gear housing allowing access to worm gear. Provide drain plugs, overflow pipes, and oil-level indicators. Include seals preventing lubricant escape.

### 2.3.2 Gears and Bearings

\*\*\*\*\*  
**NOTE: When possible the use of sealed bearings is encouraged. One of the major causes of bearing failures is overlubrication and lubrication contamination. Using sealed bearings helps to eliminate this failure mode.**  
\*\*\*\*\*

Worm and high speed shaft shall be [one piece steel construction], mounted with heavy-duty anti-friction bearings and preloaded thrust bearings. Mount worm gear on drive shaft with [roller] [\_\_\_\_\_] bearings. Provide means for bearing lubrication. Drive shaft shall have integral flange to connect driven shaft.

### 2.3.3 Drive Sheave

Sheave shall be [steel [with grooves]] [\_\_\_\_], designed to provide maximum traction and minimum wear. [Grooved non-metallic inserts on drive sheave may be provided at Contractor's option.] Sheave shall be bolted to flange integral with shaft. Bearings for assembly shall be [roller] [\_\_\_\_\_] type. Provide means for bearing lubrication.

### 2.3.4 Brake

Provide [spring-actuated electrically released] brakes. Brake shoes shall be lined with fireproof friction material. Provide [helical] [\_\_\_\_\_] brake springs, operating in compression to apply brakes when released by magnet. Brake release shall be quick and controlled obtaining gradual stops under rated loads. Brakes shall be activated by:

- a. Various safety devices,
- b. Upon interruption of power,
- c. When equipment fails to function safely in during car operations,



d. Upon stopping of car.

#### 2.3.5 DC Hoist Motor

\*\*\*\*\*  
NOTE: When possible the use of sealed bearings is encouraged. One of the major causes of bearing failures is over lubrication and lubrication contamination. Using sealed bearings helps to eliminate this failure mode.  
\*\*\*\*\*

Hoist motor shall be high-starting-torque, low-starting-current [direct] [\_\_\_\_\_] -current motor designed for elevator service. Motor shall comply with NEMA MG 1, and be UL listed. Motor speed control shall be [generator-field control] [\_\_\_\_\_] type.

Motor shall be [open] [\_\_\_\_\_] construction, with [grease] [oil] lubricated anti-friction bearings.

##### 2.3.5.1 Armature

Armature shall be electrically balanced. Armature and brake drum shall be mechanically balanced. Windings in armature and field shall permit easy removal.

##### 2.3.5.2 Commutator

Design commutator and brushes to prevent sparking or overheating under required loads. Brushes shall be adjustable.

#### 2.4 MOTOR-GENERATOR SET

\*\*\*\*\*  
NOTE: When possible the use of sealed bearings is encouraged. One of the major causes of bearing failures is over lubrication and lubrication contamination. Using sealed bearings helps to eliminate this failure mode.  
\*\*\*\*\*

Power to hoist motor shall be supplied by motor-generator set consisting of an alternating-current motor and [direct] [\_\_\_\_\_] -current generator sized for power requirements stated. Motor shall meet requirements of Section 16225 MOTORS. Motor and generator shall meet NEMA MG 1 requirements and be UL listed. Design system for 50 degree C temperature rise, continuous duty rating. No load synchronous speed of motor-generator set shall not exceed [1800] [\_\_\_\_\_] rpm. Provide [anti-friction] bearings with [oil reservoirs] [automatic lubrication system] [connections for grease lubrication].

Motor-generator shall operate only when a car or landing button has called for elevator service. [Provide 30-second interval before motor-generator

stops after calls have been answered.] [Motor-generator shall stop after an interval adjustable from [1] [\_\_\_\_\_] to [12] [\_\_\_\_\_] minutes after calls are answered.]

## 2.5 AC HOIST MOTORS

Polyphase squirrel cage induction motor designed for use with Variable Voltage Variable Frequency (VVVF) drives low slip with high breakdown torque.

Mechanical construction with cast iron frame and brackets, hot rolled steel shaft, regreaseable ball bearings; open drip-proof, totally enclosed fan cooled, or totally enclosed non-ventilated enclosures.

Motor insulation system shall be Quantum Shield or equal for VVVF drive duty.

Motor duty for VVVF applications shall be 30 minutes for high slip designs at nameplate rating. Motor temperature rise at nameplate ratings shall be: 60 degrees C by resistance for all enclosure types with a Max room ambient of 40 degrees C.

Motor shall comply with all applicable NEMA standards per publication MG-1 latest edition and revisions. Motors shall be CSA listed and have appropriate CSA marking on the nameplate.

## 2.6 HOISTWAY AND CAR DOORS (PASSENGER ELEVATORS)

Provide doors having 1-1/2 hour UL rating.

### 2.6.1 Door Construction

Car and hoistway doors shall be flush construction of [steel] [\_\_\_\_\_] . Provide door panel with sound-deadening materials.

Door shall be equipped with removable guides running in slots in car sill.

Doors shall be carried on concealed overhead tracks secured to car and door framing. Hangers shall be [ball-bearing sheave type with sealed bearings] [\_\_\_\_\_] , commensurate with operating requirements. Adjustable upthrust rollers shall be of [steel with sealed ball bearings] [\_\_\_\_\_] . Tracks shall be of [steel] [\_\_\_\_\_] formed to contour of rollers.

Doors shall be finished in [manufacturer's standard baked-on system] [\_\_\_\_\_] .

### 2.6.2 Door Operator

Car and hoistway doors shall be operated simultaneously by high speed, [direct] [\_\_\_\_\_] current, heavy duty electric operators. Motor shall conform to NEMA MG 1, Section 16225 MOTORS, and be UL listed. Design doors to be opened manually when power fails.

### 2.6.3 [Door Safety Devices]

Provide doors with interlock and auxiliary door-closing devices to ensure safe elevator operation. Equip doors with full length, adjustable reversing door edge devices which shall retract when doors are open. Provide two independent [infrared] [\_\_\_\_\_] photoelectric safety eyes directed across the entrance to door control units.

### 2.6.4 [Light Curtain]

Provide doors with interlock and auxiliary door-closing devices to ensure safe elevator operation. Equip doors with full length light curtains which shall retract when doors are open. The light curtain shall provide maximum protection with all beams active from the door being fully open to the door being open less than 1/4 inch. Light beams shall cover from 1 inch above the car floor at least 66 inches above the car floor with no more than 3 inch separation in the beams.

## 2.7 HOISTWAY ENTRANCES AND CAR GATES (FREIGHT ELEVATORS)

### 2.7.1 Hoistway Entrances

Vision panel with [wire] [laminated] [-glass] [\_\_\_\_\_] shall be provided in hoistway doors. Dimensions and location of panel shall be [as indicated] [\_\_\_\_\_].

Steel guides, with [roller-bearing wheels] [\_\_\_\_\_], shall provide, stable door travel.

Doors shall be [steel] [\_\_\_\_\_] panels set in frames. Embossed panels shall be secured to door by welding.

Doors shall be finished in [the manufacturer's standard baked-on system] [\_\_\_\_\_].

Equip vertical biparting doors with safety devices preventing upper door section from falling.

### 2.7.2 Car Gates (Freight Elevator)

Construct gate of [1-1/2-inch 38 millimeter diamond mesh] [or] [expanded metal] in [reinforced steel] [\_\_\_\_\_] frame.

Equip gate with [four] [\_\_\_\_\_] guide shoes running on tracks fastened to gate posts. Counterweight both ends of the gate. Connect gate ends to guided counterweights in each post by cable and pulley system. Counterweight guidance system shall be cushioned.

### 2.7.3 Door and Gate Operators

Hoistway doors and car gates shall move using motor-driven operators. [Provide motor for each car gate and [provide two motors] for each hoistway entrance.]

Motors shall conform to NEMA MG 1, applicable requirements of Section 16225 MOTORS, and be UL listed.

## 2.8 ENTRANCES (PASSENGER ELEVATORS)

[Metal] [\_\_\_\_\_] entrances shall be provided, including hardware necessary for installation. Raised floor designations shall be provided on both jambs in accordance with ICC A117.1.

Frames shall be [steel] [\_\_\_\_\_] , finished in the manufacturer's standard [\_\_\_\_\_] [three-coat baked acrylic] [melamine-alkyd enamel] [[corrosion-resistant steel] [\_\_\_\_\_] in [ASM 06542G No. 6] [\_\_\_\_\_] finish].

Sills shall be [cast iron] [\_\_\_\_\_] with nonslip surface. Grooves for guides shall be designed for free door travel. Sills shall be supported on steel anchors from the floor-supporting steel.

[Steel angle struts] [\_\_\_\_\_] shall support frame and door-operating hardware.

Plates and dust covers shall be [steel] [\_\_\_\_\_] , securely fastened to the entrance structure, and be removable.

Finish exposed surfaces of plates, dust covers, and other entrance accessory items other than corrosion-resistant steel with manufacturer's standard [\_\_\_\_\_] [baked acrylic] [enamel].

Nonexposed ferrous surfaces of entrance accessory items shall be wirebrushed, [solvent] cleaned and protected by [primer and finish coat of paint conforming to SSPC Paint 102] [\_\_\_\_\_] .

## 2.9 ENTRANCE FRAMES (FREIGHT ELEVATORS)

Entrance sill shall be of [[malleable] [nodular] cast iron] [\_\_\_\_\_] materials securely anchored into floor construction.

Finish exposed surfaces same as hoistway doors [and in color selected].

## 2.10 OPERATION AND CONTROL SYSTEMS (PASSENGER ELEVATORS)

### 2.10.1 Controller

Provide [microprocessor based, [preprogrammed] [programmable] logic] [magnetic hardwire relay] [dynamic torque closed loop vector drive] controllers. [Provide separate controllers for each elevator.]

It is the intent of NASA to retain the capability of performing any and all elevator maintenance and repairs with in-house elevator technicians. Should any Contractor knowingly choose to install proprietary "black box" equipment then it must provide all ancillary diagnostic and programming tools along with any and all pertinent instructions and documentation required to operate those tools, including codes. This information should allow a competent elevator technician adequate information to reprogram the controller and diagnose problems within the system. All replaceable system

components, including integrated circuits, printed circuit boards, or any other such components, should be readily available for the elevator supplier.

#### 2.10.2 Control Panel

Components required for proper performance of elevator shall be mounted, wired, and enclosed in cabinets with [lockable] doors.

Provide panels located in corridors, lobbies, or other public locations with locks and provide [2] [\_\_\_\_\_] keys.

Control devices shall conform to Section 16286 OVERCURRENT PROTECTIVE DEVICES and be UL listed.

#### 2.10.3 Elevator Controls

Place elevator car and corridor stations in accordance with ICC A117.1, or provide supplemental panels to accommodate handicapped users.

Cab and corridor call buttons shall be marked for vision impaired users, as specified in ICC A117.1.

##### 2.10.3.1 Passenger Car Station Panels

Equip car with [front overhead illuminated] [\_\_\_\_\_] panel. Panel shall be [corrosion resistant steel] [\_\_\_\_\_] with [ASM 06542G No. 6] [\_\_\_\_\_] finish.

Equip cars with DOOR OPEN and DOOR CLOSED buttons, [switch], ALARM [pushbutton] [\_\_\_\_\_] , fan and light switches, and pushbuttons corresponding to floors served. Provide key-operated inspection and maintenance switch.

[Incorporate key-operated INDEPENDENT SERVICE operation switches [and lighted OTHER CAR PLEASE sign switches].]

Indicators shall permit reading of numerals without glare from any point in car during normal operations. [Numerals shall be minimum [1] [25][\_\_\_\_\_] inch millimeter high.]

Illuminated buttons shall show stops to be made in direction that car is about to travel. Device shall indicate floor being approached, remain illuminated until car has stopped at the indicated floor, and change when car leaves indicated floor.

##### 2.10.3.2 Corridor Stations

Provide corridor station [consistent with the decor of the area] [and] [with illuminated UP pushbutton] in accordance with ICC A117.1, at first floor landing. Provide matching top floor station incorporating DOWN pushbutton.

Floors other than first and top floor shall have corridor stations matching first floor station incorporating UP and DOWN pushbuttons.

Face plates shall be finished matching adjacent surfaces.

## 2.11 OPERATING SYSTEM (FREIGHT ELEVATORS)

### 2.11.1 System Controllers

Provide [microprocessor based, [preprogrammed] [programmable] logic] [magnetic hardwire relay] [dynamic torque vector drive] type controllers. [Provide separate controller for each elevator.]

It is the intent of NASA to retain the capability of performing any and all elevator maintenance and repairs with in-house elevator technicians. Should any Contractor knowingly choose to install proprietary "black box" equipment then it must provide all ancillary diagnostic and programming tools along with any and all pertinent instructions and documentation required to operate those tools, including codes. This information should allow a competent elevator technician adequate information to reprogram the controller and diagnose problems within the system. All replaceable system components, including integrated circuits, printed circuit boards, or any other such components, should be readily available from the elevator supplier.

### 2.11.2 Freight Car Station

Provide car operator panel equipped with DOOR OPEN and DOOR CLOSE buttons, EMERGENCY STOP [switch] [\_\_\_\_], light switches, and pushbuttons corresponding to floors served. Provide key-operated inspection and maintenance switch.

### 2.11.3 Landing Stations

Provide call buttons and DOOR CLOSE buttons at each landing.

## 2.12 EMERGENCY OPERATION AND SIGNALING

### 2.12.1 Emergency Alarms

\*\*\*\*\*  
**NOTE: Basic wiring for the emergency signal device, except those in the hoistway and in the car, must be shown on the electrical drawings. Specifications of this section include only hoistway and car wiring for the emergency signal.**  
\*\*\*\*\*

Provide emergency signal devices required by ASME A17.1. Emergency-signal device shall be [indoor alarm installed either in or behind grille] [outside alarm]. Alarm appearance shall be consistent with building.

Provide car and hoistway wiring in accordance with ASME A17.1 and Section 16145 STANDARD WIRING SYSTEMS. Provide junction boxes for connection to wiring outside car and hoistway.

#### 2.12.2 Fire Service

Elevator controls shall meet ASME A17.1, for firefighting service. Emergency landing shall be the [first] [\_\_\_\_\_] floor. [Designated alternate floor shall be the [\_\_\_\_\_] floor.]

#### 2.13 OPERATING DEVICES

Equip each car with [top-of-car operating device] [and] [car-leveling device].

##### 2.13.1 Top-of-Car Operating Device

Provide operating devices which permit operation of car at [150] [760] [\_\_\_\_\_] fpm millimeter per second to adjust, maintain, test, and repair elevators. Devices shall meet requirements of ASME A17.1 and shall be mounted in positions accessible to work crews.

##### 2.13.2 Car Leveling Device

Equip elevator with a [one-way automatic] [two-way automatic maintaining] [two-way automatic nonmaintaining] leveling device, as defined by ASME A17.1.

#### 2.14 COMMUNICATIONS

Provide vandal resistant speaker telephone meeting requirements of telephone system and ASME A17.1. Locate [behind a perforated grille in the car station] [\_\_\_\_\_] . Means to activate telephone from within car shall [not] be provided.

#### 2.15 GUIDERAILS

Provide guiderails conforming to ASME A17.1.

#### 2.16 COUNTERWEIGHTS

Provide counterweights sized to equal weight of elevator plus [40] [\_\_\_\_\_] percent minimum and [45] [\_\_\_\_\_] percent maximum of elevator's rated capacity.

Concrete weights are not acceptable.

#### 2.17 HOISTING ROPES

Provide wire ropes conforming to ASME A17.1.

#### 2.18 EMERGENCY EXIT

Provide hinged exit in car ceiling. Attach exit cover with non-removable fasteners, accessible only from top of car.

[Provide side exit doors in cars adjacent to each other in a common hoistway. Provide latch type lock, operable from outside the elevator car and by using specially designed tools from within car.]

Equip emergency exits with interlocks preventing movement of car when in use. Cause alarm system to sound when exit door opens.

#### 2.19 ENTRANCE SILL (FREIGHT ELEVATORS)

Entrance sill shall be [malleable] [or] [nodular] cast-iron [\_\_\_\_\_] securely anchored into the floor construction.

#### 2.20 TERMINAL STOPPING DEVICES

Provide stopping devices and control switches. Operate normal terminal stopping devices using switches [meeting the requirements of ASME A17.1] [of the [\_\_\_\_\_] type].

#### 2.21 SAFETIES

Provide elevators with ASME A17.1 type [A] [\_\_\_\_\_] safeties.

#### 2.22 ELECTRICAL PROTECTIVE DEVICES

\*\*\*\*\*  
**NOTE: Normally, electrical protective devices must include those identified in ASME A17.1, Rule 210.2 by the letters B, C, D, E, G, H, J, K, M, N, P, Q, R, D, and U; devices F and T are required under special circumstances, which are apparent from the wording in Rule 210.2.**  
\*\*\*\*\*

Equip Elevator with electrical protective devices required by ASME A17.1, Rule 210.2.

Buzzer shall activate, and protective timing circuitry bypassed, in event of photoelectric unit failure or beam is interrupted by smoke or other means. Provide system bypass for either light beam permitting normal operation of unaffected systems. Provide individual cut out switches located in car station.

Timing functions shall be controlled by adjustable timing devices.

#### 2.23 ELECTRICAL

Electrical equipment shall meet referenced standards within this section.

Electrical service for drive system shall be [\_\_\_\_\_] volt, 60 Hz, 3-phase ac, [ungrounded] [neutral grounded]. Service for car lighting shall be [\_\_\_\_\_] volt, single-phase, 60 Hz grounded. A feeder, with [circuit breaker] [fused disconnect switch] located in elevator machine room, shall terminate at control panel for each elevator. A car lighting junction box conforming to Section 16145 STANDARD WIRING SYSTEMS [and telephone junction box meeting requirements of telephone system,] shall be provided [as indicated].



## 2.24 PAINTING (FREIGHT ELEVATORS)

Paint materials shall meet referenced standards in this section.

Paint elevators [with the manufacturer's standard finish.] [in accordance with Section 09970 COATINGS FOR STEEL.]

## PART 3 EXECUTION

### 3.1 INSTALLATION

Install systems in accordance with the manufacturer's recommendations, ASME A17.1 and ASME A17.2.

Electrical wiring shall be in accordance with NFPA 70 and Section 16145 STANDARD WIRING SYSTEMS.

Weld each connection between elevator structure, hoistway, and building in conformance with AWS D1.1/D1.1M.

In instances where removability is required, connection shall be with bolts conforming to ASTM A 325 ASTM A 325M.

Mount Control panels flush when located in finished areas with covers finished in [baked enamel] [\_\_\_\_\_] in color shown, or as directed.

When installing panels in corridors, lobbies, or other public locations Install each panel with a lock and tag the keys for each lock installed.

Installation Drawings shall be submitted for electric passenger and freight elevator systems accordance with the paragraph entitled, "Installation," of this section. Drawings shall include hoistway layout in plan, in elevation, with guiderails, brackets, layout information, equipment room layout and design, and dimensions required by ASME A17.1.

### 3.2 TESTING

#### 3.2.1 Test Weights

Test weights required will be furnished by the Government. Contractor shall arrange for their use and return.

#### 3.2.2 Tests

Perform inspection and tests required by applicable portions of ASME A17.1.

Measured leveling tolerances, using 6-foot 1830 millimeter straightedge laid flat on higher of two surfaces, shall be plus or minus [1/8] [3] [\_\_\_\_\_] inch millimeter under every rated loading condition.

Perform acceptance inspection and tests in accordance with Section 1003, ASME A17.1.

Continuous-operations test: Elevator is operated continuously with rated

loading, starting cold, for 30 minutes over its entire operating range, stopping at every floor. No component will be permitted to fail.

Temperature rise test: At the end of continuous-operations test run, measure temperature rise of the following:

- a. Insulated winding shall not exceed 50 degrees C ambient.
- b. Commutator shall not exceed 55 degrees C rise.
- c. Temperature within the driving machine enclosure shall not exceed 55 degrees C above ambient temperature.

### 3.3 MANUFACTURER'S FIELD SERVICE

Provide on-site training for operating staff. Training period shall start after system is functionally complete but prior to final acceptance testing. Provide training instruction for [\_\_\_\_\_] hours, conducted [during] [\_\_\_\_\_] normal working hours, covering all items contained in each maintenance and operating manual. Demonstrate routine maintenance operations.

### 3.4 OPERATION AND MAINTENANCE

Provide [four] [\_\_\_\_\_] copies of Operation and Maintenance Manuals giving complete instructions for operation, inspection, testing, and maintenance of each system, including equipment troubleshooting checklists.

-- End of Section --